

SOURCE : Fujitsu LTD.
TITLE : Low delay coding mode
PURPOSE : Information

1. Introduction

As a result of discussion at the Yokosuka meeting, it was agreed that one of the most important requirements for defining TM0 (and also for H.26X) is the realization of low delay mode. In relation to this issue, the necessity of clarifying the effect of bi-directional prediction (B-frame) at the target bit rate of the next standard was recognized, as it has great influence on coding delay. In this document, a comparison between coding schemes with and without backward prediction is described using the hierarchical coding scheme described in AVC-122.

2. Computer simulation results and comparison of delay time

Figure 1 shows the encoder block diagram of the coding scheme (Hierarchical Lapalacian Pyramid Coding : HLPC). Non-compatible mode with backward prediction (I,P,B-frames) and without backward prediction (I,P-frames) were simulated. In the latter case, IPP' mode, in which P-frames are periodically allocated a lower bit rate than usual (P'-frame), and IP mode, in which all the P-frames are evenly coded, were both evaluated. Table 1 shows the simulation results of each coding scheme for the Flower Garden. In this simulation, Encoder 2 and 3 were based on MPEG1. The results show that in IPP' mode, maximum loss in SNR due to the omitting of backward prediction is 1.8dB when the total bit rate is 4Mb/s, and 1.4dB when it is 9Mb/s. In the case of IP mode, the loss is 1.8dB when the total bit rate is 4Mb/s, and 1.7dB when it is 9Mb/s. The reproduced picture will be demonstrated by VCR at the meeting.

Table 2 shows the total delay time (from encoder input to display) for each coding mode as a function of M. It is assumed that the time required to encode or decode 1 field of data in each encoder or decoder is just 1 frame time (33ms). Delay due to buffering the coded bitstream and transmission are not included. According to the results, if M=3 the delay time is almost 200ms when backward prediction is used.

3. Conclusion

The effect of the B-frame on coding performance and delay was evaluated through computer simulation.

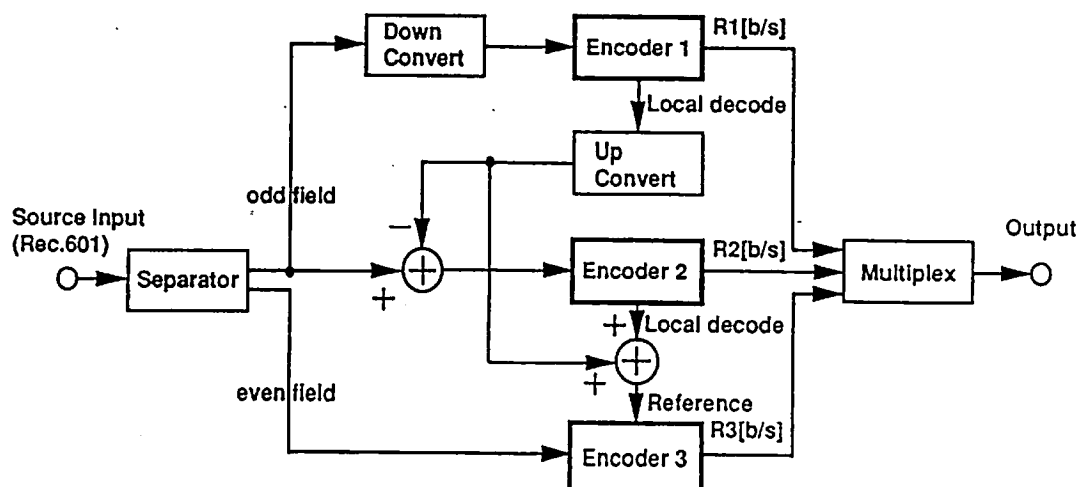


Fig.1 : Encoder block diagram of HLPC

Table 1 : Coding performance

	S / N [dB]					
	With B-picture		Without B-picture			
	IPB mode (10:5:1)		IPP' mode (10:5:1)		IP mode(10:2)	
	Bit rate 0/3M/1M	Bit rate 0/6M/3M	Bit rate 0/3M/1M	Bit rate 0/6M/3M	Bit rate 0/3M/1M	Bit rate 0/6M/3M
odd (Y)	30.5	33.9	28.9	32.5	29.0	33.0
(Cb)	32.8	35.9	31.7	34.6	31.4	34.3
(Cr)	33.8	36.4	32.8	35.2	32.6	34.7
even(Y)	26.7	31.4	24.9	30.1	24.9	30.1
(Cb)	31.1	33.6	29.5	32.6	29.5	32.6
(Cr)	33.1	34.6	31.6	33.5	31.7	33.5

Table 2 : Delay from input to display

	With backward prediction	Without backward prediction
Delay(frame)	6 *	2

* Delay = M + 3 (M : distance between I and P, or P and P)